Update on the attenuation length monitor for the filling system

Forschergruppe JUNO

Heike Enzmann

September 2017, Hamburg

Gefördert durch DFG Deutsche Forschungsgemeinschaft

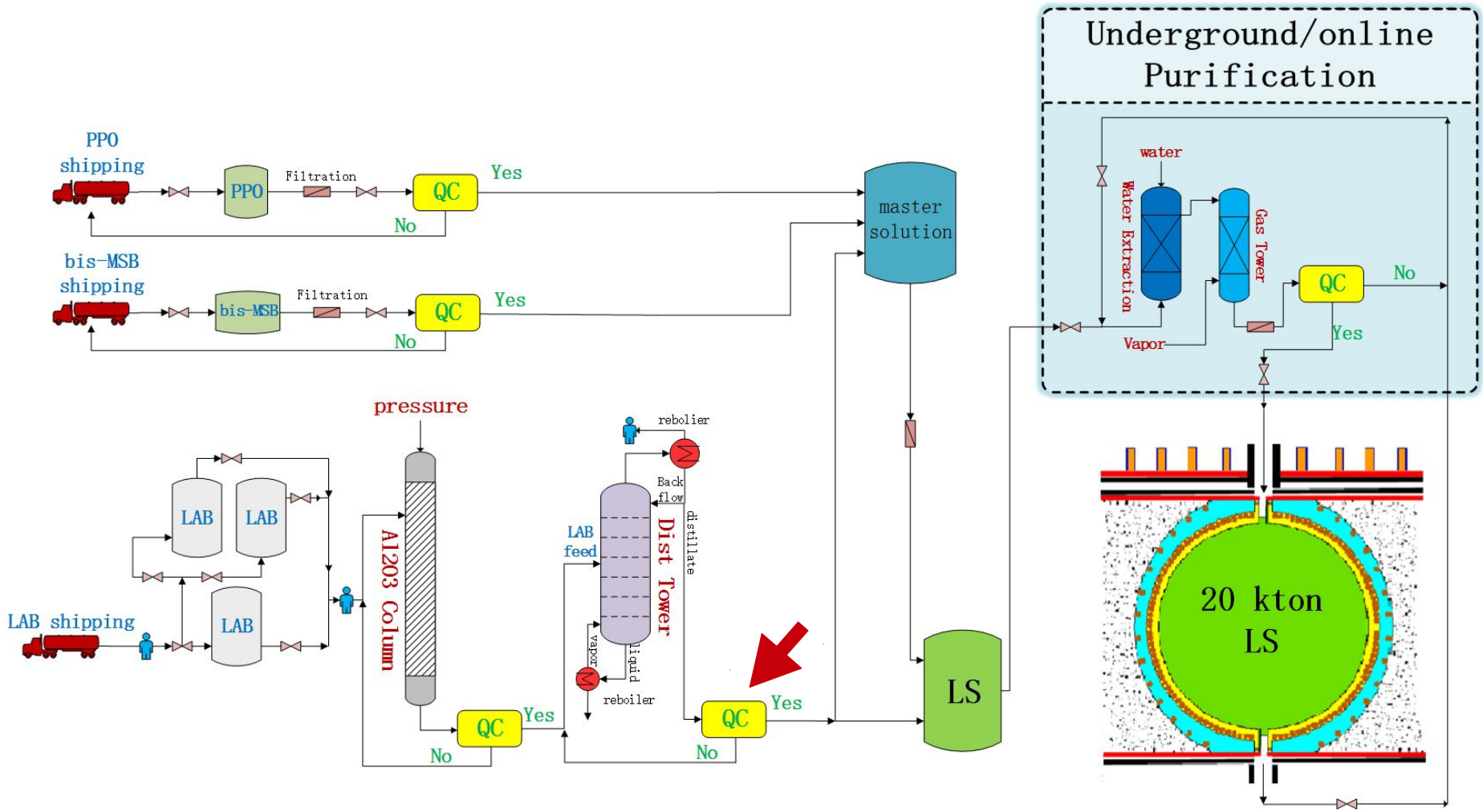
JG|U

Attenuation Length Monitor

- Test LAB quality of every new batch
  - Before mixing on site
  - Quasi-continuous measurement
    - → By direct integration into the liquid handling system

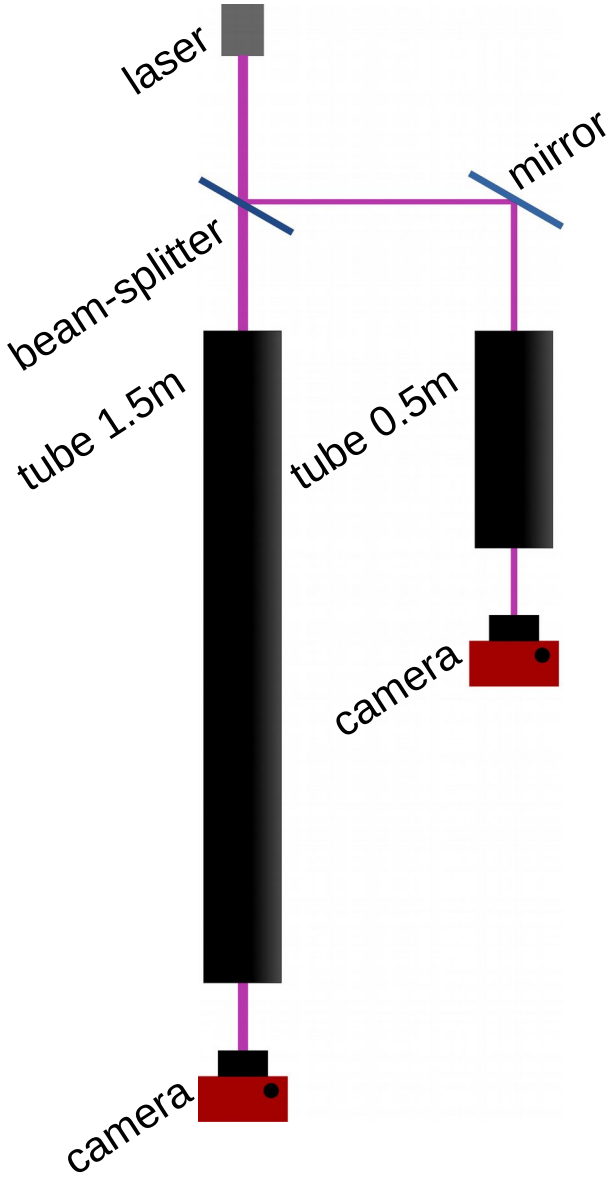
→ avoid contamination of CD

Monitoring of LS



Setup

- Laser
- Mirror and beam splitter
- Two separate tubes
  - Parallel measurement
  - Identical light-sources
  - Identical interfaces and light path
    (except optical path length in LS)
  - Reduces systematics
- CCD Cameras for Measurement



First measurements with test setup

- With test setup
  - Using Toluene
  - → Measured value 5.4 +- 0.8 m
  - → Expected value 5.7 +- 0.5 m

→ correct measurement

  - However uncertainty is still way to large

Current Issue

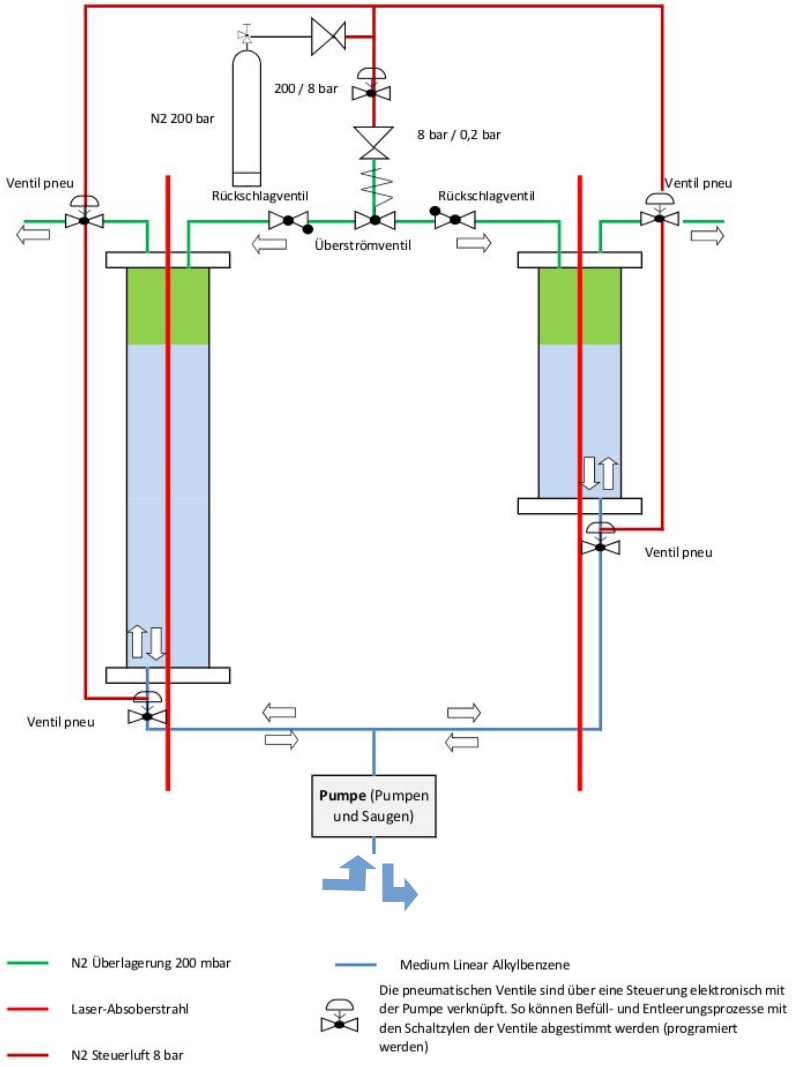
- Complicated handling
  - → Working on filling system

- Systematic uncertainties to large
  - → Upgrade setup to reduce uncertainties
    - Cleaner laser spot
    - Minimize movement in LAB
    - Precise calibration of cameras

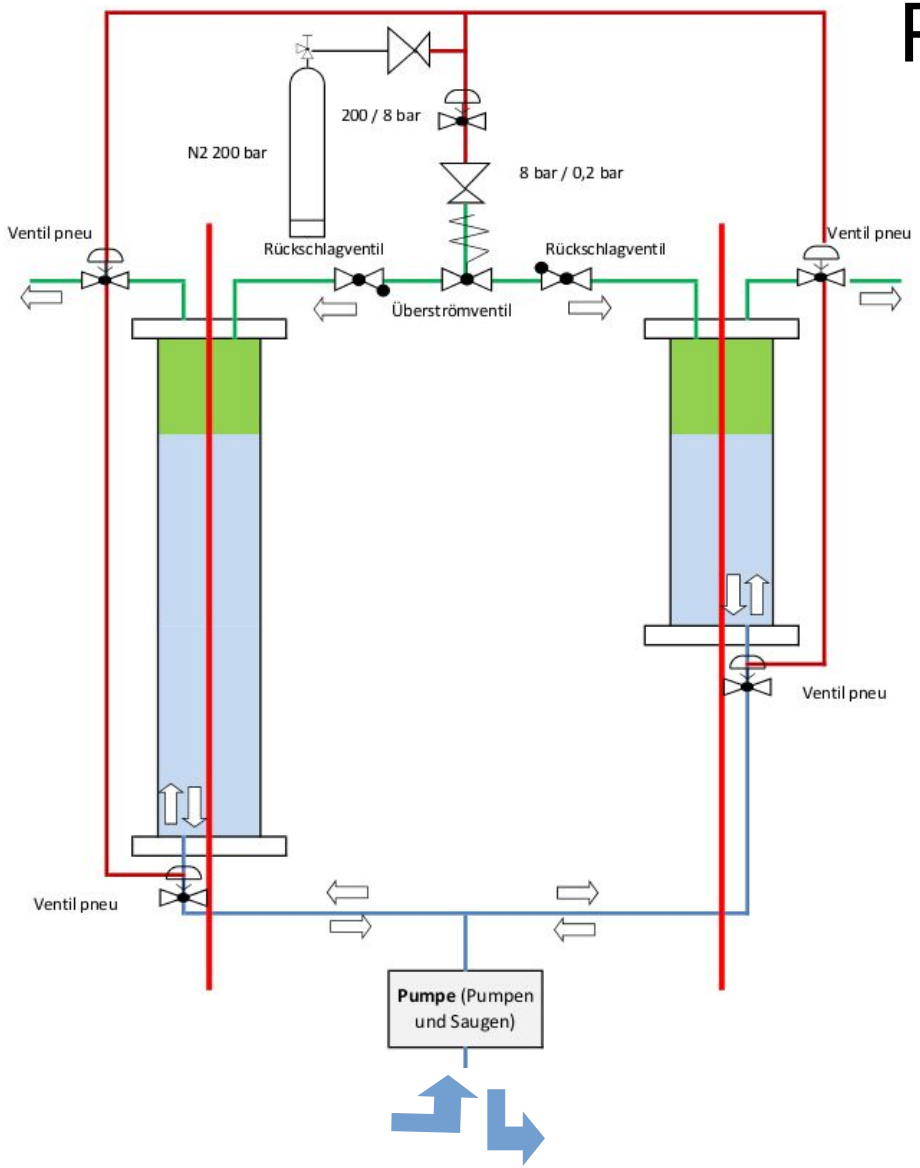
Upgrade of setup

Work on filling system

- New setup in lab
- Nitrogen atmosphere
- Valves for stability
- Computer control filling



Upgrade of setup



Filling system

- Filling tubes form bottom
- Computer controlled valves
- Nitrogen Atmosphere Check valves

N2 Überlagerung 200 mbar

Laser-Absoberstrahl

N2 Steuerluft 8 bar

Medium Linear Alkylbenzene

Die pneumatischen Ventile sind über eine Steuerung elektronisch mit der Pumpe verknüpft. So können Befüll- und Entleerungsprozesse mit den Schaltzylen der Ventile abgestimmt werden (programiert werden)

Upgrade of setup

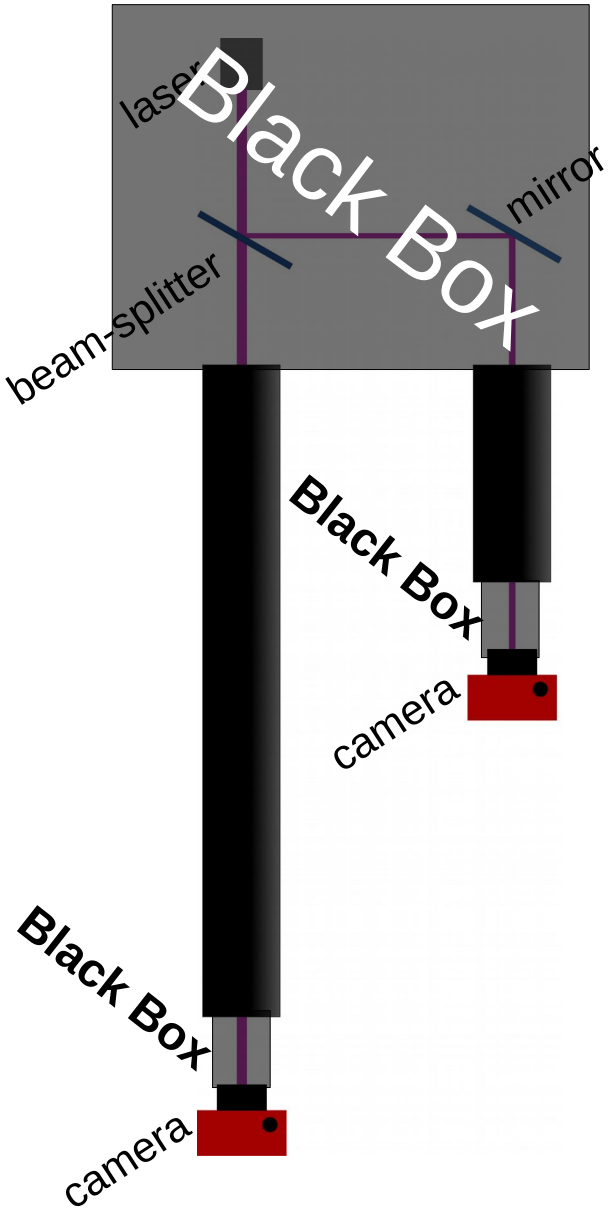
New Laser

- 405 nm laser diode
- 20 mW, Ø5.6 mm
- Temperature controlled
  → Better stability
- Better beam profile

Upgrade of setup

Cleaner laser spot

- Replaced laser
  - Better beam profile
- Ad black box
  - around optical components
  - In front of cameras



Upgrade of setup

- Precise calibration of cameras
  - Calibrate each pixel
    - → Using software from Munich

- Minimize movement in LAB
  - Measure with closed valves
  - Pump turned of
  - Examine influence of laser

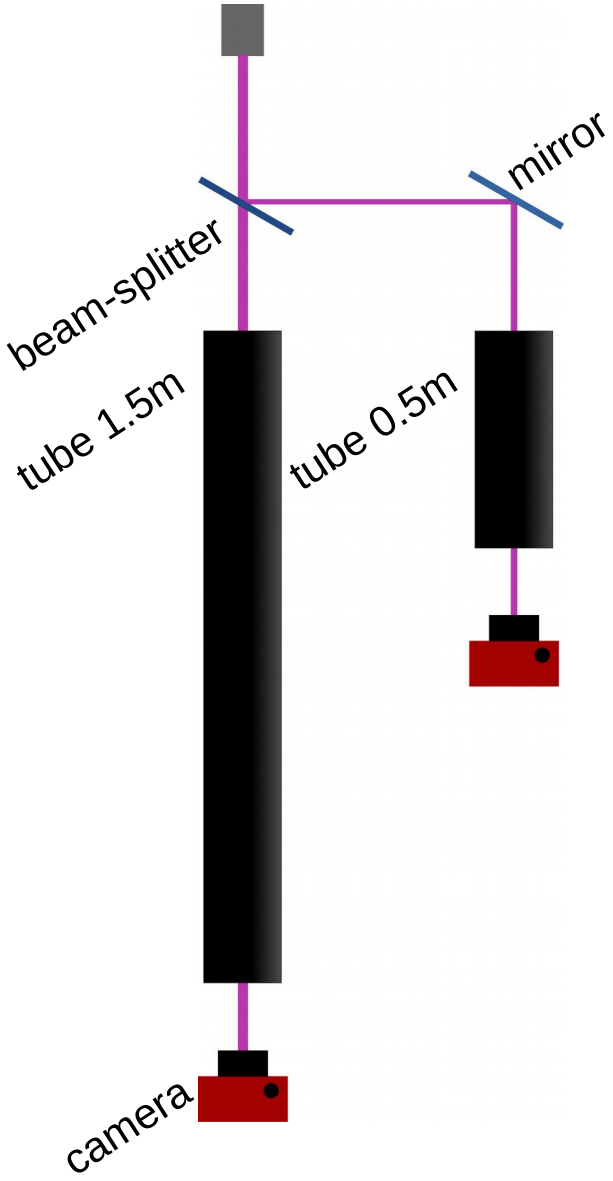
Current Status

Monitor was up and running

- All components work together
- First measurements were taken
  - Measured L of toluene

Working on improvements

- Laser
- Filling system
- Calibration



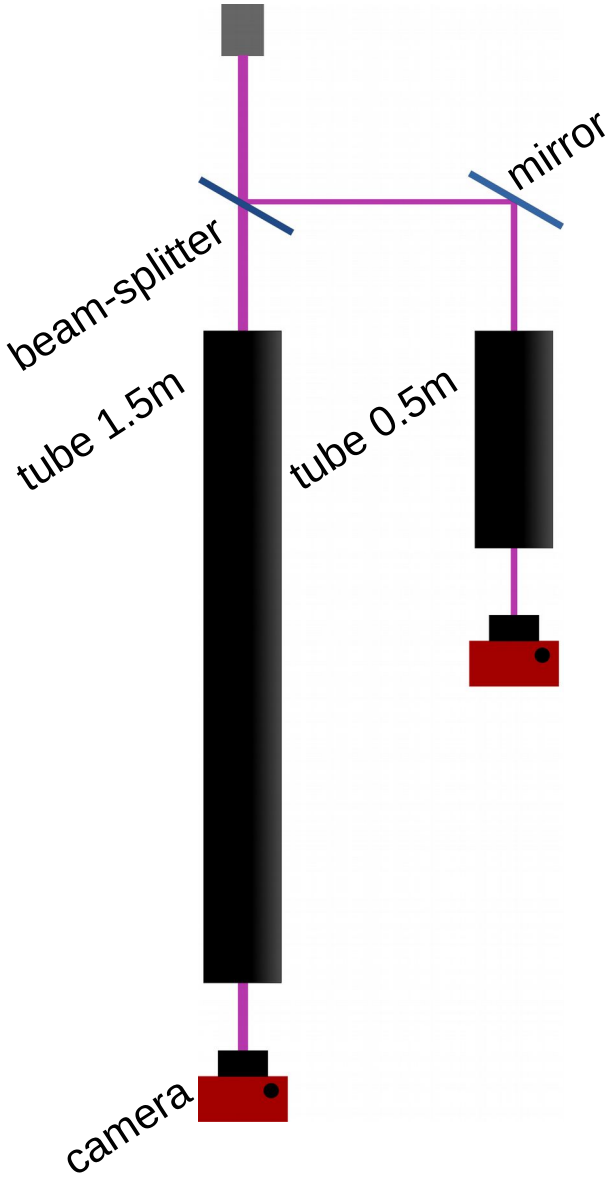
Next Steps

Test new setup in lab

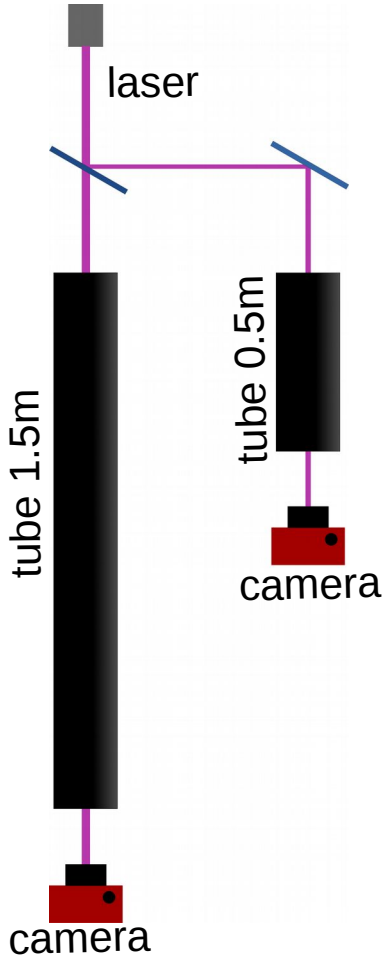
Develop computer control
for pump and valves

Design Integration for JUNO

- Ensure stability in JUNO



Thank you
for your attention



Laser at 405 nm